# QLIF Workshop 4: Performance of organic and low input livestock systems: a matter of sound design?[1]

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## Abstract

*A range of challenges associated with organic and other 'low input' (especially outdoor) livestock production systems have been identified. These include the need to identify alternative approaches for the control of parasites and gastrointestinal diseases to further reduce veterinary medicine use and antibiotic/anthelmintic resistance development. QLIF workshop 3 will summarise the fourth year's results of the livestock subproject (SP4) of the QualityLowInputFood IP. At the same time, it will contribute to the discussion on how organic livestock farming systems are being evaluated: by their design (input) or by their performance (output). This paper summarises QLIF results from SP4 in the context of current scientific knowledge.*

## Introduction

Organic production systems aim to provide various benefits to society. These benefits are associated with the four main principles of IFOAM: Health, Ecology, Fairness and Care (IFOAM, 2005). Implementation of these principles into organic livestock systems involves careful study on how housing and management factors affect the health and welfare of animals, the environment we live in and the farmer's income. This is not an easy task, as the underlying housing and management techniques used to make the principles operational do not always complement each other (Hovi et al 2003; Cooper et al 2007). This is the main reason why there are still a number of technological restraints in organic livestock production systems, which affect quality and safety of organic and "low input" foods as well as the cost of production (Spoolder

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et al. 2007). The QualityLowInputFood (QLIF) project aims to address some of the most relevant gaps in our knowledge when taking up this challenge. The gaps relate to: **(a)** the control of endo- and ecto-parasites (WPs 4.1 and 4.2, **(b)** alternatives to antibiotics for the control of gastrointestinal infections and mastitis (WPs 4.3 and 4.5), **(c)** feeding regimes which improve meat quality and minimise amino acid imbalances in monogastric production systems (WP4.4) and **(d)** the problem of negative energy balances in dairy systems, while improving milk quality (WP4.5).

## Output and contribution of the QLIF project to the state-of-the-art

***WP4.1 Improved preventive strategies for controlling endo- and ectoparasites and bacterial zoonoses of pigs and poultry.***

POULTRY The risk of parasitic infections is increased in hens in free-range systems compared to systems without outdoor access (Permin et al, 1999). Improvements in run management and reducing the stocking density from 5$m^2$ / hen to 10 $m^2$ / hen can significantly reduce faecal egg counts FEC of the two helminth species of poultry (*Ascaridia galli* and *Heterakis gallinarum*) on outdoor runs. Experiments on the effect of litter management on litter infectivity and transmission of *A. galli* and *H. gallinarum* as well as feeding trials with potential anthelmintic plants are ongoing.

PIGS - *Ascaris suum* is the most prevalent helminth on organic pig farms (Carstensen et al., 2002) and is transmitted mainly via the faeces. A first study therefore focused on assessing the efficacy of different protocols for cleaning the dunging area of pigs on *Ascaris suum* transmission to pigs. Experiments are ongoing, but preliminary results suggest that improved cleaning protocols alone are not able to reduce *Ascaris* infections, but should be part of a package of measures against *Ascaris*. A second study quantified the effect of dietary inclusion of dried chicory roots on Oesophagostomum spp. infections in naturally infected sows and boars, since pilot studies had shown that dietary inclusion of dried chicory roots may reduce infection and egg excretion levels in pigs (Spoolder et al., 2007). Dried chicory abolished egg excretion within 2-6 days, but after withdrawal of the chicory faecal egg counts increased. Nevertheless, overall egg excretion remained significantly below that of the control animals in both trials and can therefore be recommended for use strategic use in organic and 'low input' pig production systems.

***WP4.2 Alternative treatment strategies for controlling endo- and ectoparasites of pigs and poultry*.**

*POULTRY* Control of the poultry red mite *Dermanyssus gallinae* is a challenge for organic as well as conventional egg producers. A range of alternative treatments including diatomaceous earth supplemented with pyrethrum and essential oils, a liquid formulation of silica were tested *in vitro* and tests with plant extracts and different oil types are ongoing. In on farm experiments, diatomaceous earth was effective during a limited period only, whereas 2 liquid formulations of silicas had a very good residual effect against red mite.

*PIGS* In organic pig farms, this percentage of pig livers that need to be condemned due to *Ascaris suum* is often higher than in conventional pig farms. To reduce the use of synthetic drugs (e.g. benzimidazoles, levamisole and macrocyclic lactones) herbal preparations were tested for the prevention and control of a mild infection of *Ascaris suum* in growing and finishing pigs. While not decreasing the number of infected pigs some herbal treatment reduced the average number of worms in the gastro intestinal tract. Studies currently focus on identifying the suitable period to supply this herb mixture to sows and the potential of combining herbal remedies with reduced doses of veterinary drugs.

***WP4.3 Methods to augment non-immune system based defence mechanisms against gastrointestinal diseases in the pig.***

Probiotic *Bifidobacterium* strains, prebiotic and acidified nitrite supplements were assessed for their potential to control gastrointestinal pathogens causing diarrhoea in pigs. The ability of microencapsulated probiotic strains to pass through the acid barrier of the stomach and establish increased population density in the intestine was demonstrated. However, although antimicrobial activity of acidified nitrite treatments and the ability of probiotic strains to inhibit enteric pathogens was demonstrated *in vitro* (Biavati et al. 2007), this could not so far be confirmed in experiments *in vivo*. Also supplementing organic growing-finishing pigs with maize silage, grass silage or a probiotic preparation did not significantly affect performance and carcass traits.

***WP4.4 Strategies to improve sensory quality and food safety of pork without the use of amino-acid supplements, while improving production efficiency within organic farming conditions.***

Due to the restricted availability of limited amino acids in organic livestock production protein accretion capacity is limited compared to conventional production. Sensory quality of pork is to a high degree influenced by the intramuscular fat (IMF) content and previous studies showed that pig diets were the main source of variation for the IMF content in pork. In on-farm trials the effect of the implementation of a specific feeding strategy using a high portion of home-grown grain legumes on the IMF content of pork, was assessed under different conditions on German and Austrian organic farms. Results showed that different to previous feeding regimes had no significant influence on the IMF but that there was great variation between the farms for IMF. It was therefore concluded that there is a need for a direct assessment of IMF-content of pork at the abattoir to fulfil the expectations of consumers with regard to a high eating quality of organic pork.

***WP4.5 Efficient farm/farmer group specific mastitis prevention plans.***

The objective of this ongoing study is to identify the main factors influencing udder health in organic dairy farms under different climatic and structural conditions. Results show that improvement of housing/environmental conditions and farmers' skills allow a partial conversion to a non-antibiotic treatment scheme based on teat sealant dry-off prophylaxis. Also, calves reared with their mother were shown to grow faster, while no negative effect of suckling on the somatic cell count or a negative impact on animal health status were observed. The effect of suckling calves on the resistance of adult animals to mastitis and the overall results of the mastitis prevention plan programme will be known at the beginning of 2009.

***WP4.6 Bovine feeding regimes which improve production efficiency, microbiological safety and/or sensory quality of milk.***

Preliminary observations at IGER showed that feeding clover silages (CS) increases the polyunsaturated fatty acid content of milk. However, the effect of CS based diets on faecal shedding of enteric pathogens was not previously investigated. Studies at IGER gave no clear indications that feeding red clover silage affects faecal shedding of *L. monocytogenes* or *E. coli*. However studies demonstrated that milk and milk protein yields can be significantly improved by feeding red clover silage (RCS) as 1:1 mix with maize silage, but that the efficiency of utilisation of forage N was reduced when diets contained more than 10% RCS.

## Conclusions

The results obtained in the QLIF project over the last four years have provided recommendations to farmers and other stakeholders on how to improve organic

livestock farming. Significant progress was made in areas of housing, feeding and management. Often the recommendations are straightforward, and ready for implementation, e.g. the recommendation to provide roughage to pigs (WP4.4) to improve gut health, or the inclusion of dried chicory to combat *Oesophagostomum* (WP4.1). In other areas challenges remain. For example, reducing endoparasitic burden and keeping the use of conventional anthelmintics to zero appears to be rather difficult (WP4.2). In some cases, progress with respect to one objective have created new challenges. For example, under WP4.5 the maternal rearing of calves increased calf live weights at weaning, but resulted in unacceptable levels of cow, calf and farm stress at weaning. In these cases it is difficult to decide whether or not a change is an overall improvement or not.

To facilitated decision making the following key questions will be discussed as part QLIF workshop 3 at the Modena IFOAM/ISOFAR congress

1. What constitutes a high performance organic livestock system (consider the various stakeholders - farmer, animal, consumer, certification body, broader society, etc)?
2. Given answers to the above question - what are the key indicators of organic livestock system performance?
3. How do we measure these indicators?
4. Are there any major conflicts when trying to achieve high levels of system performance – what are they, who do they affect and can we reduce them?

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